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A Test of Measured Dosages for Chemical Control of Allegheny Hardwoods

by
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A Test of Measured Dosages for Chemical Control of Allegheny Hardwoods

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PREVIOUS work by Bramble et al *(1)*, Suggitt *(2)*, Trevett *(3)*, and Worley et al *(4)* has shown that high spray volumes are more effective than low volumes in the basal bark treatment of woody plants with herbicides such as 2,4,5-T in kerosene or other oils.

To determine the minimum volume and concentration of oil-herbicide solutions that will prevent or reduce the sprouting of cut stubs of small hardwood reproduction, the study reported here was made by the Northeastern Forest Experiment Station. A second objective of the study was to observe the effect of measured dosages and certain concentrations of 2,4,5-T applied as basal treatment to standing trees of reproduction size.

The tests were made on the right-of-way of a power line serving the U.S. Forest Service's Kane Experimental Forest in Elk County, Pennsylvania. Species available for study were beech, sweet birch, and black cherry. The maples, normally to be expected on such an area, had been practically eliminated by deer browsing.

Treatment of Stubs

Procedure

During the second week of May 1955, the reproduction in a strip about 20 feet wide along the center of the power line was mowed. Selected stubs in this mowed strip, and others from newly cut saplings, were treated during the period July 14 to 22, 1955.

Selection of stubs for treatment was on the basis of fairly uniform stem caliber, single-stemmed form, and species. Ten stubs of each species were tagged for each treatment. The selected stubs were 4 to 6 inches tall and mostly from ½ to 1½ inches in stem caliber at the root collar. Beech root suckers were treated as individual stems though some were known to be from the same parent root.

A treatment series for each species comprised 5 different dosages of each of 4 concentrations of 2,4,5-T in kerosene--a total of 20 treatments, as listed in table 1. An ester form of 2,4,5-T was used. Concentrations are expressed as pounds acid equivalent per hundred gallons.

All litter and other debris was removed from around the base of the stub before solutions were applied. Since Trevett *(3)* showed that it is not necessary to pour solutions over the cut end of the stub, only the root collar was treated. With the 1-cc treatment it was necessary to use a small bristle brush to spread the solution evenly over the entire basal circumference. Pouring was started at a point about 1 inch above the root collar on the upper side of the stem. Run-down to the roots occurred with dosages of 4 cc or more.

All treated stubs were examined in June and September 1956. The latter records are essentially final for this study of stub treatments.

Figure 1.--The power line on the Kane Experimental Forest, showing the mowed strip used in the study of herbicide dosages.

Results & Discussion

Within a week after treatment, curling and wilting of sprouts on the May-cut stubs were noted. Later in the 1955 season these sprouts died and turned brown. Since the July-cut stubs bore no sprouts, no effects were evident on them for some time.

Sweet Birch
And Yellow Birch

Birches cut in May had developed sprouts or live basal buds by July 1955. Those cut in July had produced some sprouts by June 1956. At that time 80 percent of the untreated check sample of birch had live sprouts, and 20 to 50 percent of those treated with 1 to 4 cc of plain kerosene

had also sprouted. During the summer of 1956, however, all sprouts on the check sample and practically all on the treated stubs died (see table 2).

Table 1.--Specifications of treatments used

Amount of solution per stub		Concentration: 2,4,5-T acid equivalent per 100 gallons			
		0*	1 lb.	2 lbs.	4 lbs.
cc	oz.	milligrams of 2,4,5-T per stub			
1	0.0338	0	1.193	2.387	4.775
2	.0676	0	2.387	4.775	9.550
4	.1352	0	4.775	9.550	19.100
8	.2705	0	9.550	19.100	38.200
16	.5410	0	19.100	38.200	76.400

*Kerosene only.

Table 2.--Number of stubs bearing live sprouts in June 1956 and September 1956, by treatment and species

(Basis: 10-stub samples.)

Dosage		Beech		Birches		Black cherry	
Kerosene	2,4,5-T acid equivalent per 100 gal.	June	Sept.	June	Sept.	June	Sept.
cc	lbs.						
(*)	(**)	6	4	8	0	4	1
1	--	4	5	2	0	5	2
2	--	3	6	3	1	2	1
4	--	2	7	5	0	2	1
8	--	1	3	0	0	0	0
16	--	1	2	0	0	0	0
1	1	2	0	1	1	3	3
2	1	2	0	0	0	1	2
4	1	0	0	0	0	0	1
8	1	0	0	0	0	0	0
16	1	0	0	0	0	0	0
1	2	1	0	0	0	1	2
2	2	0	0	0	0	0	2
4	2	0	0	0	0	0	1
8	2	0	0	0	0	0	0
16	2	0	0	0	0	0	0
1	4	0	1***	0	0	1	0
2	4	0	0	0	0	1	0
4	4	0	0	0	0	0	0
8	4	0	0	0	0	0	0
16	4	0	0	0	0	1	0

*No kerosene applied.

**No chemical applied.

***Probably faulty application: this stub was missed in 1955 or was misidentified in 1956 re-examination.

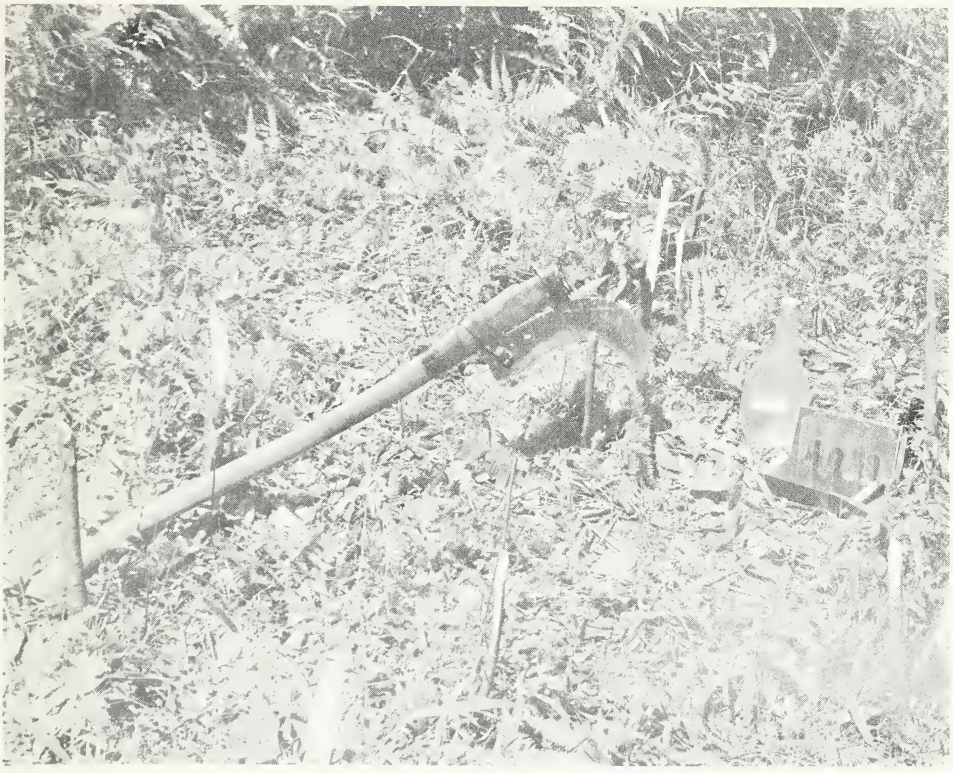

Figure 2.--The mowed strip, showing cut stubs ready for herbicide treatment.

We must assume that practically all of this mortality would have resulted regardless of treatment. Saprophytic fungi had begun to attack some of the oldest dead stubs by September 1956. The high mortality or low sprouting capacity of the birches at the end of the first full growing season shows that mowing alone will eliminate all but a few individuals. Even light herbicidal treatments are not required to control sprouting of sweet and yellow birch stubs under the conditions of this study.

Beech

The beech studied were mostly of root-sucker origin and showed sprout activity during the remainder of the 1955 growing season and at the time of the June 1956 examination.

Figure 3.--Treating a cut sapling stub with 2,4,5-T in kerosene. The herbicide was applied to the root collar with a small brush.

Figure 4.--Applying herbicide to a standing sapling. Standing trees were much more resistant than cut stubs.

Sixty percent of the sample of untreated stubs showed sprouts in June 1956. Treatment with kerosene only did not entirely prevent sprouting either by June 1956 or September 1956, though the heavier dosages resulted in less sprouting than the lighter dosages (see table 2). The kerosene-treated stubs, in fact, showed somewhat greater percentage of living sprouts at the end of the 1956 season than in June, indicating some recovery.

With 1 or more pounds of 2,4,5-T added per 100 gallons of kerosene, the treatments were quite effective in reducing the sprouts. By September 1956 practically no live sprouts remained on any herbicide-treated beech (table 2).

Since beech sprouts, even on small stubs, are not aggressive, it seems apparent that they can be controlled with small dosages and low concentrations of 2,4,5-T in kerosene applied as a basal spray. There are indications that mowing in early May will reduce beech sprouting: cutting the stems in July, after the season's growth has reached its peak, will not.

Black Cherry

The vaunted sprouting ability of black cherry was not evident in these tests. Seventy to 80 percent of the stubs either failed to sprout, or the sprouts had died by September 1956. This was due partly to the fact that much of the cherry in the study area had been small suppressed stems. It had been overtopped by the birches or crowded by beech root suckers, and was seldom of the upper canopy. These low-vigor trees could not be expected to sprout vigorously after cutting because of their small root systems. However, black cherry was more resistant to treatment than beech. As table 2 shows, some sprouts survived the weaker treatments until September 1956.

Since oil is cheaper than herbicide, the use of 8 or more cc of solution containing 1 pound of 2,4,5-T per hundred gallons will be the least expensive dosage for complete elimination of sprouts from black cherry stubs of this character. The kerosene alone has excellent herbicidal properties at the 8- and 16-cc dosage per stub. The 1-pound concentration of 2,4,5-T would be added insurance against sprouting.

Standing Reproduction

Procedure

From July 26 to 29, 1955, a series of four basal treatments was applied to 10-tree samples of beech, sweet birch, and black cherry standing on both sides of the mowed strip on the right-of-way. The treatments were:

Kerosene alone, 4 cc per stem

2,4,5-T in kerosene, 1 pound/100 gallons, 1 cc per stem

2,4,5-T in kerosene, 2 pounds/100 gallons, 4 cc per stem

2,4,5-T in kerosene, 4 pounds/100 gallons, 16 cc per stem

Application methods were similar to those used on stubs. Examinations were made in June and September 1956. Crown condition of each tree was rated as: (1) normal, (2) slight injury, (3) severe injury, or (4) dead.

Table 3.--Crown condition classes in June and September 1956, by treatment and species

(In percentage of 10-tree samples)

Crown condition	Beech		Birches		Black cherry	
	June	Sept.	June	Sept.	June	Sept.
4 CC KEROSENE						
Normal	100	60	100	90	70	30
Slight injury	0	20	0	10	0	20
Severe injury	0	0	0	0	10	20
Dead	0	20	0	0	20	30
1 LB. 2,4,5-T PER 100 GAL. 1 CC KEROSENE						
Normal	10	10	40	50	20	20
Slight injury	70	30	40	30	30	10
Severe injury	20	60	20	20	40	30
Dead	0	0	0	0	10	40
2 LB. 2,4,5-T PER 100 GAL. 4 CC KEROSENE						
Normal	0	0	20	30	0	0
Slight injury	60	30	40	30	70	50
Severe injury	40	40	40	40	10	20
Dead	0	30	0	0	20	30
4 LB. 2,4,5-T PER 100 GAL. 16 CC KEROSENE						
Normal	0	0	10	10	0	0
Slight injury	0	0	0	0	0	0
Severe injury	30	20	40	20	30	10
Dead	70	80	50	70	70	90

Results & Discussion

None of the treatments had any visible effect during the 1955 growing season. Results in June and September 1956 are shown in table 3 by species and treatment.

Only the strongest treatment--4-pound concentration, 16 cc dosage--resulted in sizable percentages of severe crown damage for all species. Even with this treatment, complete crown kills of all trees were not obtained by September 1956 or the spring of 1957. A few additional standing trees had died by October 1957. Others continue unaffected. The 1957 drought may be partly responsible for the recent death of a few of the sample treated trees.

Of the three species, black cherry was the most sensitive to the weaker treatments. As noted in discussing the stub treatments, the cherry here was mostly small-crowned and of relatively low vigor. This may have lowered its resistance. The considerable resistance of the standing sweet birch saplings to all except the strongest treatment was in marked contrast to the high mortality of stubs of the same species.

Browning of foliage was noted on untreated beech root suckers adjacent to some of those that had been given the strongest treatment. Evidently in these instances treated and untreated suckers had root connections, probably having originated from the same parent root. Maximum distance of such killing by translocation was about 6 feet.

Summary

- Cutting off regeneration of sweet and yellow birch in May or July resulted in early weak sprouting but practically all stubs were dead by September of the following growing season. Herbicidal treatments were not required to control sprouting of stubs of these species.

- Four cc per stub of a kerosene solution of 2,4,5-T at a concentration of 1, or at most 2, pounds acid equivalent per 100 gallons eliminated practically all sprouting of beech stubs cut in May and July.

- Eight cc per stub of kerosene solution of 2,4,5-T at 1 pound per 100 gallons completely eliminated sprouting from stubs of small black cherry saplings.

- Standing regeneration was much more resistant to treatment than stubs. A high percentage of severe crown injury or crown kill of standing regeneration was obtained only with dosages of 16 cc of 2,4,5-T per tree in kerosene solution at 4 pounds acid equivalent per 100 gallons.

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